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ASSESSMENT AND EVALUATION OF FLUORIDE CONCENTRATION IN GROUNDWATER OF PALNADU REGION: A MODEL STUDY

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ABSTRACT

Water plays an important role in the world economy which is approximately 70% of the freshwater used by humans goes to agriculture. Safe drinking water is essential to humans and other life forms even though it provides no calories or organic nutrients. Access to safe drinking water has improved over the last decades in almost every part of the world, but approximately one billion people still lack access to safe water and over 2.5 billion lack access to adequate sanitation. The concentration of fluorine in water causes several effects for human beings. In this study we deal with the effects that are caused by the high concentrations of fluorine in water and also suggests some preventive measures to be taken for decreasing the fluorine concentrations in water. Here we collected water samples of different regions and tested with the instrument namely Fluoride Electrode Instrument and identified the high fluoride concentrated area. Fluoride is added to public water supplies at an average concentration of about 1 part per million (1ppm) or 1 milligram per liter, or slightly below. Naturally occurring fluoride concentrations in surface waters depend on location but are generally low and usually do not exceed 0.3 ppm. The Highest fluoride level concentrations are recorded as 1.5mg/lit at the Jammalamadaka Panchayat of Macharla Mandal and Chinakodamagundla, Chintapalli Panchayats of Karempudi mandal.

Key words: Fluoride effected zones, water quality, Village wise analysis.

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1. INTRODUCTION

The word Fluorine is derived from the Latin 'fluo', which means to flow. The symbolic representation of Fluorine is 'F' and the atomic number in the periodic number is 9. The atomic mass is 18.998404 amu and fluorine belongs to Halogen family. The melting point of Fluorine is -219.62°c and the boiling point of it is -188.14°c.Guntur district is one of the Central coastal districts of Andhra Pradesh. It comprises 57 mandals under administrative control of 3 divisions namely Narasaraopet, Guntur and Tenali. The district has 729 villages and 1036 hamlets. It has a geographical area of 11,328 Sq. Kms. It lies between North latitudes 15°18'&16°50' and East longitudes 79°10'00" & 80°55'00".The annual normal rainfall of the district is 889.1 mm. southwest and northeast monsoon contributes59% and 26% respectively. Krishna, Nagulleru, Chandravanka and Gundlakamma rivers drains the district. The district has been gifted with the vast surface and ground water resources. About 3.01 lakhha area is irrigated by canals and it has ground water recourses of 1.72 lakh ham. Out of the total geographical area of 11,328 sq. km, 10.27% of the area is covered by forests. Similarly, barren and uncultivable land is 3.04% and cultivable waste and current fallows put together is 4.8%. The net area sown is 56.81%.

1.1. Description of Study Area

Palnadu is the northern region of Guntur District in the Indian state of Andhra Pradesh. Gurazala is the capital of the region Palnadu. Palnadu is also known as Pallava Nadu, it occupies an important place in Telugu history. In rememberance of Pallava dynasty this region is still known as Palnadu. The Fig.1 clearly shows the region of Palnadu. The average annual rainfall of the district is 864 mm, which ranges from nil rainfall in January to 160 mm in August. August is the wettest month of the year. The mean seasonal rainfall distribution is 547 mm in southwest monsoon (June-September), 235 mm in northeast monsoon (Oct-Dec), 8 mm rainfall in Winter (Jan-Feb) and 74 mm in summer (March – May). The season-wise percentage distribution of rainfall is 63% in southwest monsoon, 27 % in northeast monsoon, 1 % in winter and 9 % in summer. The mean monthly rainfall distribution is shown in Fig-2. The annual and seasonal rainfall distribution with its departure from mean along with percentage distribution (year-wise) is furnished in Table.1

Figure 1 Study Area

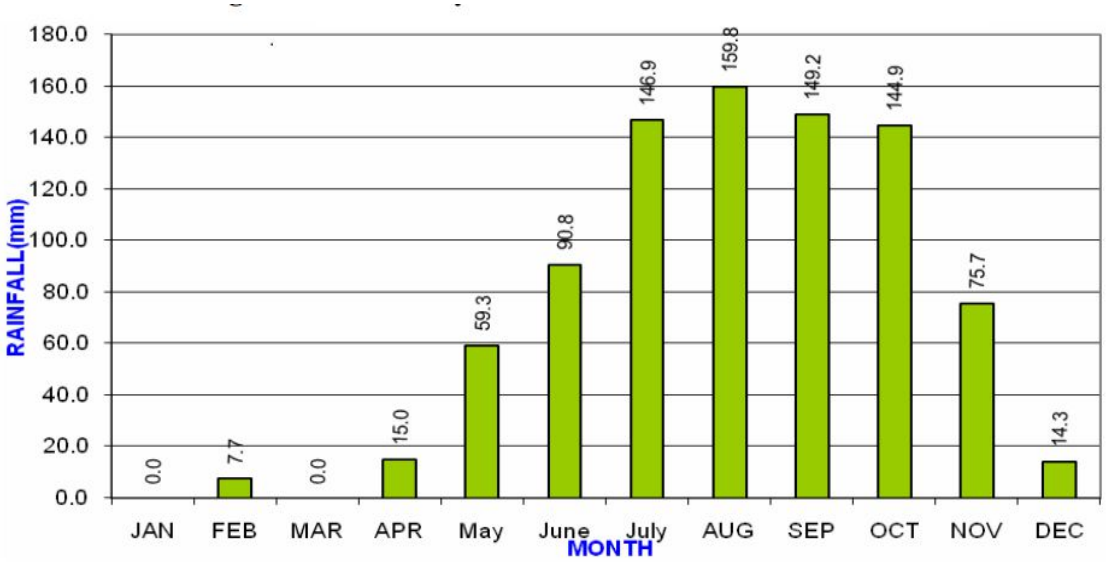

Figure 2 Graphical representation of Rainfall Distribution of study area

Table 1 Rainfall distribution in the study area

Sl.No	Year	Annual	SWM	NEM	Winter	Summer	SWM %	NEM %	Winter %	Summer %	Departure from LPA %
1	2000	722.0	544.0	131.0	3.0	44.0	75.35	18.14	0.42	6.09	-16
2	2001	991.0	804.0	77.0	42.0	68.0	81.13	7.77	4.24	6.86	15
3	2002	885.8	601.0	228.8	0.0	56.0	67.85	25.83	0.00	6.32	3
4	2003	565.4	350.4	146.0	37.0	32.0	61.97	25.82	6.54	5.66	-35
5	200	914.1	631.8	258.3	23.0	23.0	69.1	28.2	0.11	2.52	6

	4							6			
6	2005	759.5	526.3	151.5	77.8	77.8	69.30	19.95	0.51	10.24	12
7	2006	952.7	612.3	259.3	75.6	75.6	64.27	27.22	0.58	7.94	10
8	2007	852.6	366.0	304.2	182.4	182.4	42.93	35.68	0.00	21.39	-1
9	2008	1008.6	791.1	157.2	48.2	48.2	78.44	15.59	1.20	4.78	17
10	2009	964.5	650.0	176.9	91.9	91.9	67.39	18.34	4.74	9.53	12
11	2010	643.6	429.8	153.8	60.0	60.0	66.78	23.9	0.00	9.32	-26
12	2015	1485.1	936.6	365.4	174.5	174.5	63.07	24.6	0.58	11.75	72
13	2016	665.3	500.8	79.2	62.9	62.9	75.27	11.90	3.37	9.45	-23
Long period Average		863.7	546.8	234..9	74.3	74.3	63.31	27.20	0.89	8.60	

1.2. Irrigation

The area irrigated during the year 2010-11 through these canals is 3, 01,037 Ha., and through ground water is 77,442 Ha., Irrigation from the other sources (16,920 ha.) and through tanks 5,422 Ha. The district is blessed good network of irrigation canals of the Nagarjunasagar Right Canal Command Area, Krishna Western Delta Canal System and Guntur Channel Scheme.

2. OBJECTIVES

- Collection of samples village wise and Analyze fluoride concentrations
- Identify the fluoride effected areas

3. METHODOLOGY

3.1. Sample Collection

Water samples were collected village wise in the study area from 245 different locations. were samples were collected in clean and dry 1000 ml polypropylene containers. Each sample was labelled giving the time, date, site and source. When collecting tap water, the tap was allowed to run for a few minutes so as to collect an evenly distributed sample of water. Collected samples were analysed for fluoride concentration using standard methods

3.2. Analysis of Fluoride in Water Samples

After collection the samples were stored in a refrigerator. The F^- concentration was analysed two weeks later by using an ion-specific electrode and difference electrode, Fluoride Electrode Instrument (Orion).

- Prepared standard solution ranging between 1.0 ppm - 0.1 ppm was chosen presuming that the unknown sample concentration of fluoride may fall in between these two standards.
- TISAB (Total Ionic Strength Adjustment Buffer), was added to the standard fluoride solutions to adjust the pH of the sample and to break up complexes.
- The instrument was calibrated with the two standard solution.
- To each water sample TISAB III was added in correct ratio.

- To determine the F^- concentration, the electrode was left to stand in the solution for 3 minutes.
- After 3 minutes the F^- concentration in the water sample was read directly from the digital display meter.

4. RESULTS AND DISCUSSION

The annual rainfall ranges from 565 mm in 2003 to 1485 mm in 2015. The annual rainfall departure ranges from -35 % in 2003 and to 72 % in 2015. The southwest monsoon rainfall contributes about 63.3 % of annual rainfall. It ranges from 350 mm in 2003 to 937 mm in 2015. The year 2010 experienced drought conditions as the annual rainfall recorded is 26% less than the long period average (LPA).The departure of annual rainfall from LPA is presented in Table 1

4.1. Geology

The area is underlain by various geological formations of different age groups ranging from Archaean to Recent. The Archaean basement complex comprising the granite-gneisses, Schists, Khondalites, Charnockites and basic dykes of dolerites form the predominant rock types in the central part. The fringe of the Archaeans in the central part is represented by Cuddapah basin, namely Nallamalai group of Upper Cuddapahs. In a sequential order, the younger Kurnools occurring in the Cuddapahs and those in the western parts of the district are thrust over by the Cuddapahs and these in turn by the Archaean granite-gneisses. The Upper Gondwana group of sandstones and shales outcrop are seen at places between Guntur and Tenali. The youngest rock types of the district appear to be of Mio- Pliocene age followed by the alluvial deposits of Recent to Sub-Recent age.

4.2. Hydrogeology

4.2.1. Pre-Monsoon Water Levels

The depth to water level during pre-monsoon (2016) range from 0.64 m to 21.46 m bgl. The shallow water levels of 2 m are observed in southeast and eastern part of the district. The depth to water levels between 2-5 m is observed in majority of the area. Deeper water levels of >10 m bgl are observed in the western parts of the district (Fig-3).

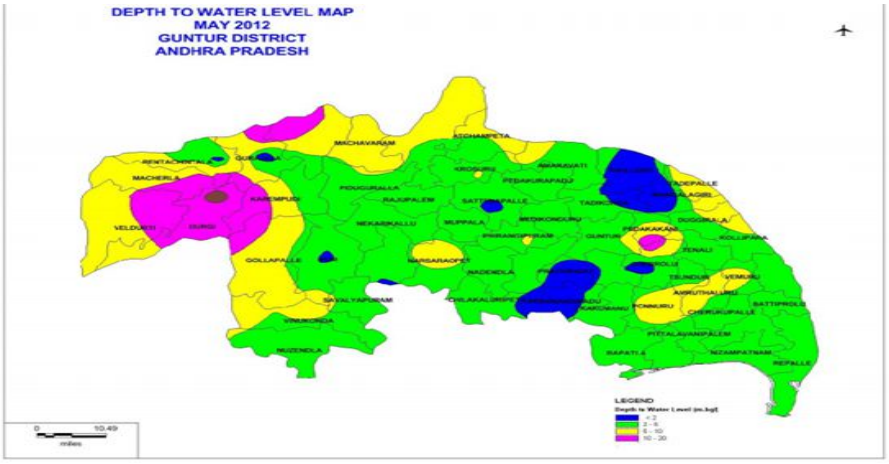

Figure 3 Depth to water level- Pre Monsoon

4.2.2. Post-Monsoon Water Levels

The depth to Water level ranges from 0.16 to 9.89m bgl during post monsoon period (2016). The shallow water levels of 2 m are observed in eastern part of the district. Water levels 2-5 m are observed in central and western part, 5-10 m and deeper are observed in western and northern part of the district (Fig-4).

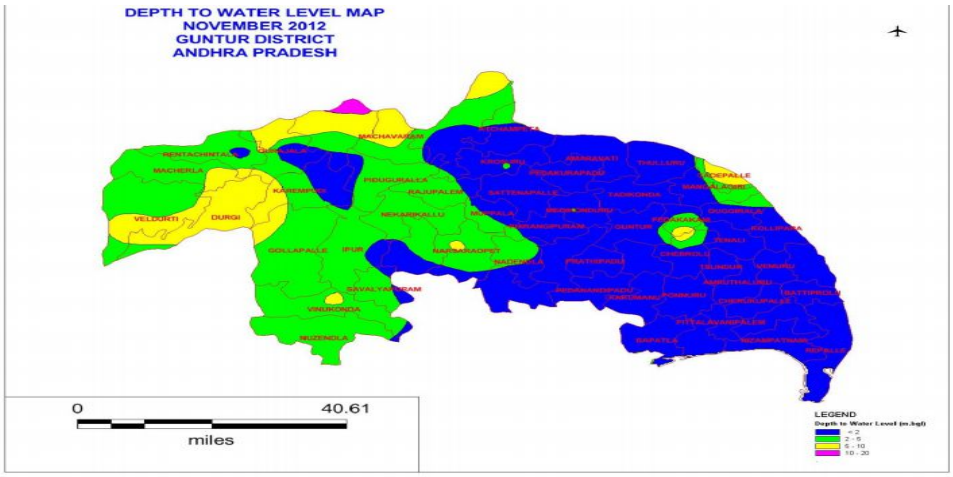

Figure 4 Depth to water level- Post Monsoon

4.2.3. Water Level Fluctuation

Majority of the district shows rise in water level between pre and post monsoon period of 2016(0-2 m). Rise of water level of 2-4 m is observed in central areas in and very small areas in western part. Fall of 2-4 and greater than 4 m is observed as isolated patches in the district (Fig.5).

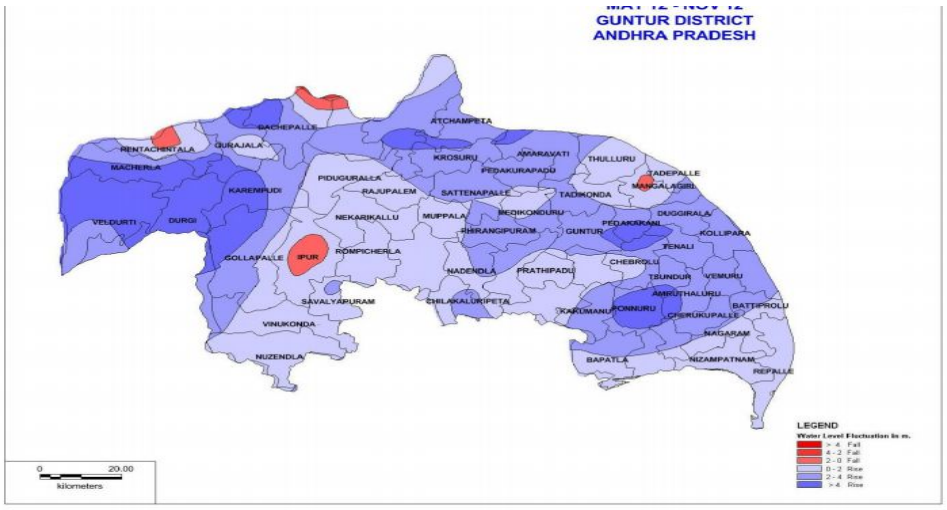

Figure 5 Water Level Fluctuations Study Map

Table 2 Calculation of Flouride Content

S.NO	LOCATION	FLUORIDE (MG/L)
	MACHERLA	
1	NAGULAVARAM	1.1
2	NAGULAVARAM	1.1
3	CHINTALATHANDA	1.4
4	PASUVEMULA	1.3
5	KOTHURU	1.3
6	EKONAMPET	1.4
7	TALLAPALLI	1.3
8	JAMMALAMADAKA	1.5
9	KHAMBAMPADU	1.2
10	GANNAVARAM	1.1
11	RAYAVARAM	1.2
12	LINGAPURAM	1.2
13	KOTHAPALLI	1.1
14	BHIRAVUNIPADU	1.2
15	KOPPUNUR	1.3
16	LATCHAMMABAVI(LN PURAM)	1.3
17	LATCHAMMABAVI(LN PURAM)	1.1
	RENTACHINTALA	
1	MALLAVARAM	1.4
2	GOLI	1.2
3	JETTIPALEM	1.4
4	MITTAGUDIPADU	1.3
5	RENTACHINTALA	1.2
6	PASARLAPADU	1.3
7	THUMRUKOTA	1.1
8	PALUVOI	1.2

S.NO	LOCATION	FLUORIDE(MG/L)
9	PALUVOI GATE	1.3
10	RENTALA	1.2
11	MANCHIKALLU	1.4
	GURAZALA	
1	GOTTIMUKKALA	1.3
2	DAIDA	1.3
3	TELUKUTLA	1.3
4	PULIPADU	1.2
5	GANGAVARAM	1.4
6	KOTHAAMBAPURAM	1.2
7	GOGULAPADU	1.3
8	BUDAWADA	1.4
9	PALLEGUNTA	1.3
10	AMBAPURAM	1.3
11	GURAZALA	1.3
12	JANGAMAHESWARAPURAM	1.4
13	CHARLAGUDIPADU	1.3
14	MADUGULA	1.3
	DACHEPALLI	
1	PONDUGALA	1.2
2	RAMAPURAM	1.2
3	SRINAGAR	1.3
4	BHATRUPALEM	1.1
5	KATRAPADU	1.2
6	GAMALAPADU	1.2
7	MADINAPADU	1.3
8	SP AGRAHARAM	1.2

S.NO	LOCATION	FLUORIDE (MG/L)
9	KOTHURU	1.3
10	TANGEDA	1.3
11	MUTYALAMPADU	1.2
12	DACHEPALLI	1.4
13	NADIKUDI	1.2
14	KESANUPALLI	1.2
15	TAKKELLAPADU	1.3
16	PEDAGARLAPADU	1.3
	MACHAVARAM	
1	CHENNAYAPALEM	1.2
2	VELLAMPALLI	1.2
3	GOVINDAPURAM	1.1
4	VEMAVARAM	1.2
5	REGULAGADDA	1.3
6	THURAKAPALEM	1.3
7	KOTHAPALEM	1.2
8	MORJAMPADU	1.3
9	SRIRUKMINIPURAM	1.2
10	PILLUTLA	1.1
11	K.GANESHUNIPADU	1.3
12	MALLAVOLU	1.3
13	MACHAVARAM	1.2
14	GANGIREDDYPALEM	1.3
15	PINNELLI	1.3
	BELLAMKONDA	
1	BODANAM	1.2
2	CHITYALA	1.2

S.NO	LOCATION	FLUORIDE (MG/L)
3	KOLLUR	1.3
4	VENKATAYAPALEM	1.4
5	EMMAJIGUDEM	1.2
6	MANNESULTANPALEM	1.3
7	PAPAYAPALEM	1.3
8	CHANDRAJUPALEM	1.2
9	KANDIPADU	1.3
10	VANNAYAPALEM	1.2
11	MACHAYAPALEM	1.2
12	BELLAMKONDA	1.2
13	GANGIREDDYPALEM	1.3
14	NAGIREDDYPALEM	1.2
	ATCHEMPET	
1	MADIPADU	1.2
2	CHALLAGARIGA	1.2
3	THADUVAI	1.2
4	CHINTAPALLI	1.3
5	CHERUKUMPALEM	1.2
6	PUTLAGUDEM	1.2
7	THALLACHERUVU	1.3
8	KOTHAPALLI	1.3
9	ATCHEMPET	1.2
10	NEELESWARAPALEM	1.2
11	KOGANTIVARIPALEM	1.2
12	CHIGURUPADU	1.3
13	PEDAPALEM	1.3
14	KONDURU	1.3
15	KONDURU	1.2
16	MITTAPALEM	1.2

S.NO	LOCATION	FLUORIDE (MG/L)
17	VELPURU	1.2
	KROSURU	
1	DODLERU	1.3
2	PERIKAPADU	1.3
3	AVULAVARIPALEM	1.3
4	UYYANDANA	1.4
5	ANANTHAVARAM	1.3
6	KROSURU	1.2
7	KROSURU	1.3
8	VIPPARLA	1.3
9	UTUKURU	1.3
10	BAYYAVARAM	1.3
11	BALEMARRU	1.2
12	ANDUKURU	1.3
13	PEESAPADU	1.2
14	88 TYALLURU	1.3
15	GUDIPADU	1.3
16	NAGAVARAM	1.2
	SATTENAPALLI	
1	BRUGUBANDA	1.3
2	KANDULAVARIPALEM	1.3
3	PAKALAPADU	1.3
4	GOGULAPADU	1.3
5	RENTAPALLA	1.2
6	KATTAMURU	1.3
7	GORANTLA	1.3
8	BHATLURU	1.4
9	GUJJARLAPUDI	1.2
10	PHANIDAM	1.3

S.NO	LOCATION	FLUORIDE (MG/L)
11	PHANIDAM	1.4
12	DEEPALADINNEPALEM	1.4
13	ABBURU	1.3
14	BHIMAVARAM	1.2
15	GANDLURU	1.3
16	KANKANALAPALLI	1.3
	PIDUGURALLA	
1	THUMMALACHERUVU	1.4
2	VEERAPURAM	1.4
3	KAMEPALLI	1.4
4	BRAHMANAPALLI	1.4
5	KONANKI	1.3
6	JANAPADU	1.3
7	PEDA AGRAHARAM	1.3
8	KARALAPADU	1.3
9	CHENNAYAPALEM	1.4
10	CHINA AGRAHARAM	1.4
11	JULAKALLU	1.3
	KAREMPUDI	
1	MIRIYALA	1.3
2	PEDAKODAMAGUNDLA	1.3
3	KAREMPUDI	1.4
4	PEDAKODAMAGUNDLA	1.4
5	PETASANNIGANDLA	1.4
6	BATTUVARIPALLI	1.4
7	LAKSHMIPURAM	1.3
8	GADEVARIPALLI (BATTUVARIPALLI)	1.3
9	INAPARAJUPALLI	1.3
10	KACHAVARAM	1.4

S. NO	LOCATION	FLUORIDE(mg/l)
11	CHINAKODAMAGUNDLA	1.5
12	CHINAGARLAPADU	1.4
13	CHINTAPALLI	1.5
14	OPPICHERLA	1.3
15	NARAMALAPADU	1.3
16	KAREMPUDI	1.3
	DURGI	
1	POLEPALLI	1.2
2	TERALA	1.2
3	ATMAKUR	1.1
4	ATMAKUR	1.2
5	DHARMAVARAM	1.1
6	DHARMAVARAM	1.1
7	SYAMARAJAPURAM	1.1
8	ADIGOPPALA	1.1
9	NIDANAMPADU	1.2
10	NIDANAMPADU	1.3
11	NIDANAMPADU	1.3
12	NIDANAMPADU	1.3
13	NIDANAMPADU	1.3
14	OBULESUNIPALLI	1.2
15	DURGI	1.2
16	JANGAMAHESWARAPADU	1.2
17	KOLAGUTLA	1.2
	VELDURTHI	
1	KANDLAKUNTA	1.2
2	KANDLAKUNTA	1.3

S. NO	LOCATION	FLUORIDE(mg/l)
3	KP GUDEM	1.3
4	GUNDLAPADU	1.2
5	BODILAVEEDU	1.2
6	RACHAMALLIPADU	1.2
7	SRIRAMPURAMTHANDA	1.2
8	MANDADI	1.2
9	POTLAVEEDU	1.2
10	POTLAVEEDU	1.3
11	POTLAVEEDU	1.3
12	UPPALAPADU	1.3
13	UPPALAPADU	1.3
14	VELDURTHI	1.3
15	VELDURTHI	1.2
16	SIRIGIRIPADU	1.2
17	MITTAMEEDIPALLI	1.2
18	VAZRALAPADU	1.2
19	KANDLAKUNTA	1.3
	BOLLAPALLI	
1	AYYANNAPALEM	1.2
2	GARIKAPADU	1.3
3	PAMIDIPADU	1.3
4	MARRIPALEM	1.2
5	MELLAVAGU	1.3
6	REDDYPALEM	1.2
7	JAYANTHIRAMAPURAM M	1.2
8	GUMMANAMPADU	1.2
9	REMIDICHERLA	1.2

S. NO	LOCATION	FLUORIDE(mg/l)
10	GANDIGANUMALA	1.2
11	DOMALAGUNDAM	1.3
12	RAVULAPURAM	1.2
13	GUTLAPALLI	1.2
14	BOLLAPALLI	1.2
	NEKARIKALLU	
1	GUNDLAPALLI	1.3
2	NARSINGAPADU	1.3
3	TRIPURAPURAM	1.3
4	NEKARIKALLU	1.4
5	CHALLAGUNDLA	1.4
6	CHEEMALAMARRI	1.4
7	CHAGALLU	1.3
8	KANDLAGUNTA	1.3
9	RUPENAGUNTLA	1.3
10	DECHAVARAM	1.3
11	THURAKAPALEM	1.3
12	KUNKALAGUNTA	1.4
13	CHEJARLA	1.3
	MUPPALLA	
1	THONDAPI	1.4
2	RUDRAVARAM	1.3
3	MADALA	1.3
4	IRUKUPALEM	1.3
5	BOLLAVARAM	1.3
6	DAMMALAPADU	1.3
7	THURAKAPALEM	1.3

S. NO	LOCATION	FLUORIDE(mg/l)
8	MUPPALLA	1.4
9	PALUDEVARLAPADU	1.3
10	NARNEPADU	1.3
11	L. KURAPADU	1.3
12	GOLLAPADU	1.3
	PHIRANGIPURAM	
1	TAKKELLAPADU	1.2
2	SIRANGIPALEM	1.1
3	113 TYALLUR	1.2
4	ERRAGUNTLAPADU	1.1
5	BETHAPUDI	1.1
6	VEMAVARAM	1.1
7	KANDRIKA	1.2
8	PHIRANGIPURAM	1.1
9	AMMENABAD	1.2
10	HOUSE GANESH	1.1
11	REPUDI	1.2
12	GOLLAPALEM	1.2
13	NUDURUPADU	1.2
14	MERIKAPUDI	1.1
15	MUNAGAPADU	1.1
16	GUNDALAPADU	1.2
17	PONUGUPADU	1.2
	MEDIKONDURU	
1	KORRAPADU	1.3
2	PALADUGU	1.2
3	SIRIPURAM	1.2
4	VARAGANI	1.2
S. N	LOCATION	FLUORIDE(mg/l)

S. NO	LOCATION	FLUORIDE(mg/l)
5	MANDAPADU	1.3
6	YELAVARTHIPADU	1.2
7	MEDIKONDURU	1.3
8	VISADALA	1.3
9	GUNDLAPALEM	1.3
10	PERACHERLA	1.2
11	DOKIPARRU	1.2
	NARASARAOPET	
1	PAMIDIPADU	1.3
2	DONDAPADU	1.3
3	MULAKALUR	1.3
4	M.REDDIPALEM	1.2
5	ISSAPALEM	1.2
6	K.M.AGRAHARAM	1.2
7	RAVIPADU	1.3
8	PALAPADU	1.2
9	IKKURRU	1.2
10	ALLURIVARIPALEM	1.2
11	LINGAMGUNTLA	1.2
12	JONNALAGADDA	1.3
13	KESANUPALLI	1.3
14	KOTHAPALEM	1.2
15	YELLAMANDA	1.2
16	PEDATHURAKAPALEM	1.2
17	CHINATHURAKAPALEM	1.3
18	CHINTALAPALEM	1.2
19	GONEPUDI	1.2
20	GURAVAIPALEM	1.2
S. N	LOCATION	FLUORIDE(mg/l)

S. NO	LOCATION	FLUORIDE(mg/l)
21	UPPALAPADU	1.2
22	KAKANI	1.3
23	ARAVAPALLI	1.2
24	PETLURIVARIPALEM	1.2
25	KONDAKAVURU	1.2
26	PAMIDIMARRU	1.3
	ROMPICHERLA	
1	AREPALLI	1.4
2	KARLAKUNTA	1.3
3	RAMIREDDIPALEM	1.3
4	BUTCHIBAPANAPALEM	1.3
5	SANTHAGUDIPADU	1.3
6	VIPPARLA	1.3
7	EDWARDPETA	1.3
8	V.REDDIPALEM	1.4
9	KOTHAPALLI	1.4
10	MACHAVARAM	1.2
11	PARAGATICHERLA	1.3
12	NALAGARLAPADU	1.3
13	ANNAVARAM	1.3
14	MUNUMAKA	1.4
15	GOGULAPADU	1.3
16	ALAWALA	1.4
17	ATCHAIAHPALEM	1.3
18	THURUMELLA	1.3
19	THUNGAPADU	1.4
20	ROMPICHERLA	1.3
S. N	LOCATION	FLUORIDE(mg/l)

O		
21	KONAKANCHI VARIPALEM IPUR	1.3
1	BOMMARAJUPALLI	1.3
2	INUMELLA	1.3
3	MUPPALLA	1.3
4	CHITTAPURAM	1.2
5	GOPUVARIPALEM	1.2
6	IPUR	1.3
7	AGNIGUNDALA	1.3
8	UDIJERLA	1.2
9	VANIKUNTA	1.2
10	KONDAYAPALEM	1.2
11	BOGGARAM	1.2
12	ANGALUR	1.3
13	KOTCHERLA	1.3
14	UPPARAPALEM	1.3
15	KONDRAMUTLA	1.2
16	BODEPUDIVARIPALEM	1.2
17	BHADRUPALEM	1.3
	SAVALYAPURAM	
1	KOTHALUR	1.2
2	POTLUR	1.2
3	IRLAPADU	1.2
4	VELPUR	1.2
5	SANAMPUDI	1.2
6	MUNDRUVARIPALEM	1.1
7	BONDILIPALEM	1.2

O		
8	MATHUKUMALLI	1.1
9	KANUMARLAPUDI	1.1
10	SAVALYAPURAM	1.1
11	PITCHIKALAPALEM	1.1
12	CHINA KANCHERLA	1.1
13	KARUMANCHI	1.2
14	VYKALLU	1.2
15	GUNTUPALEM	1.1
	VINUKONDA	
1	KOPPUKONDA	1.3
2	NADIGADDA	1.2
3	NEELAGANGAVARAM	1.2
4	ANDUGULAPADU	1.2
5	ANDUGULAPADU	1.2
6	SIVAPURAM	1.3
7	DONDAPADU	1.3
8	BHARATHAPURAM	1.3
9	THIMMAYAPALEM	1.2
10	UPPARAPALEM	1.2
11	VENKUPALEM	1.2
12	NARAGAYAPALEM	1.3
13	BRAHMANAPALLI	1.3
14	VITTAMRAJUPALLI	1.3
15	JALALAPALEM	1.3
16	PEDAKANCHERLA	1.3
17	PERUMALLAPALLI	1.3
18	ENUGUPALEM	1.3

O		
19	CHEEKATEEGALAPALEM	1.2
20	CHATRAGADDAPADU	1.2
21	HASSANAYUDUPALEM	1.3
22	GONUGUNTLAVARIPALEM	1.3
23	PITTAMBANDA	1.3
24	UMMADIVARAM	1.3
	NUZENDLA	
1	MURTHYUNJAYAPURAM	1.2
2	CHINTALACHERUVU	1.2
3	PEDDAVARAM	1.2
4	INAVOLU	1.2
5	P.CHERUKUMPALEM	1.2
6	MUKKALLAPADU	1.2
7	K.JADDAVARIPALEM	1.3
8	JADDAVARIPALEM	1.2
9	PAMIDIPADU	1.2
10	MUTHARASUPALEM	1.2
11	KHAMBAMPADU	1.3
12	TELLAPADU	1.3
13	UPPALAPADU	1.3
14	THRIPURAPURAM	1.2
15	JANGALAPALLI	1.2
16	MULAKALUR	1.2
17	PUVVADA	1.2
18	TALARLAPALLI	1.2

Ground water fluoride level concentrations of Palnadu region have been studied in the methodology part of the report. In the Jammalamadaka Panchayat of Macharla Mandal; Chinakodamagundla, Chintapalli, Panchayats of Karempudi mandal; the fluoride level concentrations are recorded at 1.5mg/lit, respectively. As per the International Fluoride Level Governing Organizations like, American Dental Association, The British Fluoridation Society, World Health Organization, National Academy of Sciences- Community Water Fluoridation, the recommended level of fluoride is 1mg/lit. Moreover, few important findings are summarized, based on the study of Ground Water Fluoride characteristics in the study area. Due to the abnormal presence of fluoride levels in the Ground Water of Palnadu region, the following Socio-Environmental effects are curtain raised. They are as follows: Dental Fluorosis: Enamel defects are caused by drinking fluorinated water. Arthritis: The early symptoms of Skeletal Fluorosis is a fluoride- induced bone and joint disease that impacts millions of people in India, China and Africa. Impact on Kidneys: kidneys are the human body filters which excrete the wastes but, due to the accumulation of high concentrations of fluoride they work at a slower phase and shuts down the functioning at the earliest.

Following mitigation measures may be taken to have an effective control on the Fluoride Level Concentrations:

- The Fluoride level in the daily food intake shouldn't exceed 0.3-0.6 mg/day.
- Adoption of Nalgonda Technique for water de-fluorination is feasible and effective too.
- Optimal fluoridation of water is not a risk for cancer but, excessive consumption of anything will lead to a non-renewable damage to the health and as well as to the Environment.

REFERENCES

[1] Basha MP, Sujitha NS. (2011). Chronic fluoride toxicity and myocardial damage: antioxidant offered protection in second generation rats. ToxicolInt 18(2):99-104.

[2] Dönmez N, Çinar A. (2003). Effects of chronic fluorosis on electrocardiogram in sheep.Biol Trace Elem Res 92:115-21.

[3] Fluorides and oral health, report of a WHO Expert Committee on Oral Health Status and Fluoride Use, 1994, WHO/Geneva.

[4] Wong Hee Deong, Implementation of the oral health component of the health-promoting school project, mission report, WPRO/WHO, 1997.

[5] National Research Council. (2006). Fluoride in drinking water: a scientific review of EPA's standards. National Academies Press, Washington D.C.

[6] Galletti P, Joyet G. (1958). Effect of fluorine on thyroidal iodine metabolism in hyperthyroidism. *Journal of Clinical Endocrinology* 18(10):1102-1110.

[7] Luke J. (2001). Fluoride deposition in the aged human pineal gland. Caries Res. 35(2):125-128.

[8] Luke J. (1997). The Effect of Fluoride on the Physiology of the Pineal Gland. Ph.D. Thesis. University of Surrey, Guildford.

[9] Douglas TE.(1957). Fluoride dentifrice and stomatitis. *Northwest Medicine* 56: 1037-1039. Feltman R. (1956). Prenatal and postnatal ingestion of fluoride salts: A progress report. *Dental Digest* 62: 353-357.

[10] Prival MJ. (1972). *Fluorides and human health*. Center for Science in the Public Interest, Washington D.C. pp. 23-25.

[11] Saunders MA. (1975). Fluoride toothpastes: A cause of acne-like eruptions. *Archives of Dermatology* 111: 793.

[12] Xu RY, Xu RQ. (1997). Electrocardiogram analysis of patients with skeletal fluorosis. Fluoride 30(1):16-8.

[13] Spittle B. (1993).Allergy and hypersensitivity to fluoride. *Fluoride* 26:267-73.

[14] Varol E, Varol S. (2012). Effect of fluoride toxicity on cardiovascular systems: role of oxidative stress. Arch Toxicol (Letter to the Editor), DOI 10.1007/s00204-012-0862-y

[15] SS.Asadi, Ch.Nithin Kumar Reddy, A.V.S.Prasad (January,2017).Evaluation of flood management for Krishna river bank stretch of Andhra Pradesh state,8:302-306.

[16] Shashi A, Thapar SP. (2001). Histopathology of myocardial damage in experimental fluorosis in rabbits. Fluoride 34(1):43-50.

[17] Basavarajappa H.T, Dinakar S and Manjunatha M.C, Validation of Derived Groundwater Potential Zones (GWPZ) Using Geo-Informatics and Actual Yield From Well Points in Parts of Upper Cauvery Basin of Mysuru and Chamarajanagara Districts, Karntaka, India, *International Journal of Civil Engineering and Technology*, 7 (1), 2016, pp. 141-161

[18] Dr. R.N. Uma, S. Karthiyayini and U. Sindhu Vaardini, Assessment of Fluoride Concentration in Groundwater in West Zone of Coimbatore Corporation. *International Journal of Civil Engineering and Technology,* 7(6), 2016, pp.444–448.